NITRIC ACID

CAS Registry Number: 7697-37-2 HNO_3

Molecular Formula: HNO_3

Nitric acid is a transparent, colorless or yellowish, corrosive liquid with an acrid odor. It fumes in moist air and reacts violently with alcohol, turpentine, charcoal, and organic refuse. Nitric acid is an oxidizing agent and a strong, monobasic acid (Merck, 1989).

Physical Properties of Nitric Acid

Synonyms: aquafortis; hydrogen nitrate; azotic acid

Molecular Weight:	63.02
Boiling Point:	86.00 °C
Melting Point:	-41.59 °C
Vapor Density:	2-3.0 (air = 1)
Density/Specific Gravity:	1.502 at 25/4 °C (water = 1)
Vapor Pressure:	47.8 mm Hg at 20 °C
Conversion Factor:	1 ppm = 2.58 mg/m^3

(HSDB, 1991; Merck, 1989)

SOURCES AND EMISSIONS

A. Sources

Nitric acid is used in the manufacture of inorganic and organic nitrates and nitro compounds used to make fertilizers, dye intermediates, explosives, and other organic chemicals (Merck, 1989). It is also used in pharmaceutical manufacturing, in the printing industry for photo-engraving, in jewelry manufacturing, and in the engineering industry (HSDB, 1993). Nitric acid is produced in California (SRI, 1993).

The primary stationary sources that have reported emissions of nitric acid in California are manufacturers of fabricated metal products, manufacturers of miscellaneous food and kindred products, and manufacturers of measuring and controlling devices (ARB, 1997b).

B. Emissions

The total emissions of nitric acid from stationary sources in California are estimated to be at least 2,700 pounds per year, based on data reported under the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

Nitric acid is formed in the troposphere by gas phase chemistry (HSDB, 1993).

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of nitric acid.

INDOOR SOURCES AND CONCENTRATIONS

Although nitric acid may exist in the indoor environment as a result of infiltration of ambient air and combustion processes, it is present at very low concentrations. One study conducted in Pennsylvania determined that indoor nitric acid concentrations are significantly lower that outdoor levels. Nitric acid is removed indoors through deposition on surfaces and through reaction with ammonia. The geometric mean indoor concentration of nitric acid in the Pennsylvania study was 0.2 parts per billion; 229 samples were collected (Suh et al., 1994).

ATMOSPHERIC PERSISTENCE

Nitric acid exists in the atmosphere in the gas phase. The atmospheric removal processes for gaseous nitric acid are by wet and dry deposition. The estimated half-life and lifetime for dry deposition of nitric acid is 1.5 to 2 days and 2 to 3 days, respectively, and efficient rain out during episodic precipitation events. Nitric acid reacts with gaseous ammonia to form particulate or aerosol nitrate, which in turn is removed by wet and dry deposition of the particles. The average half-life and lifetime for particles in the atmosphere is about 3.5 to 10 days and 5 to 15 days, respectively (Atkinson, 1995; Balkanski et al., 1993).

AB 2588 RISK ASSESSMENT INFORMATION

Although nitric acid is reported as being emitted in California from stationary sources, no health values (cancer or non-cancer) are listed in the California Air Pollution Control Officers Association Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines for use in risk assessments (CAPCOA, 1993).

HEALTH EFFECTS

Nitric acid is corrosive at the site of direct contact and is absorbed by inhalation and ingestion.

Non-Cancer: Nitric acid is a strong inorganic acid. Mists and vapors of nitric acid are extremely irritating to the eyes and respiratory tract. Delayed pulmonary edema may result. Symptoms of acute exposure to respiratory tract irritants include coughing, chest pain, and shortness of breath (Olson, 1994). Chronic inhalation exposure may cause bronchitis and erosion of the teeth. Nitric acid decomposes to yield nitrogen dioxide which is an even more potent lung irritant (U.S. EPA, 1995a). The United States Environmental Protection Agency (U.S. EPA) has not established a Reference Concentration (RfC) or an oral Reference Dose (RfD) for nitric acid (U.S. EPA, 1995a).

Cancer: The International Agency for Research on Cancer and the U.S. EPA have not classified nitric acid as to its carcinogenic potential (IARC, 1987a; U.S. EPA, 1995a).